

CLAIMS

1. A system for imaging the sea bottom comprising at least; a source of pulsed light in an expanded or concentrated beam; an aiming and focusing system of said pulsed light beam; a detector of light reflected from said light pulses; an optical system coupled to the detector which may selectively act as a light intensifier/shutter; an electronic system for exploring and synchronism; an electronic processing system which generates an image that can be displayed on a monitor.
2. A system according to claim 1 which in case of using a concentrated beam the detector receives information from a scene in sequential form, as a result of a synchronized two-dimensional scanning or sampling of said scene by the pulsed beam and where the detector receives an integrated illumination from a reduced portion of the total scene.
3. A system according to claim 1 which in case of using an expanded beam the detector consists of a two-dimensional array of single detectors on which an image is focused prior to detection.
4. A system according to claim 1 wherein the detector/detectors used are submerged inside the sea water.
5. A system according to claim 1 which in case of expanded beam illumination the image intensifier/shutter device is an image intensifier tube or it is integrated in the detector itself.
6. A system according to claim 3 wherein the detector is a solid state CCD or CMOS TV camera.
7. A system according to claims 5 and 6 wherein the image provided by the intensifier tube is coupled to the detector by means of an optical system.

8. A system according to claims 5 and 6 wherein the image provided by the image intensifier tube is coupled to the camera by electron bombardment of the sensitive elements of the camera, thus integrating the image intensifier tube and the camera in a single device.
9. A system according to claim 5 wherein the selective image intensifier/shutter device performs a temporal windowing based on the inversion of the photocathode bias in said intensifier/shutter device.
10. A system according to claim 1 wherein the selective intensifier/shutter device performs a temporal windowing which allows operation in a wide range of illuminations, including daylight, by means of controlling the operation duty cycle of the photocathode bias voltage or of the detector shutter device.
11. A system according to claims 5 and 6 wherein the intensifier-camera set is replaced by a CCD or CMOS camera that may operate under extremely low illumination levels.
12. A system according to claims 6 and 11 wherein the CCD or CMOS camera includes detectors or sensors in which the photogenerated electric charge is amplified in the detector itself by means of charge carrier avalanche or ion impact prior to generation of the output electric signal stored in its series register.
13. A system according to claim 1 wherein the pulsed illumination source is a laser source.
14. A system according to claim 13 wherein the laser source operates in the blue-green region of the visible spectrum, corresponding to the spectral region where light attenuation in sea water is minimum.
15. A system according to claim 13 wherein the laser source is based on a semiconductor diode-laser pumped primary oscillation in rare earth ions and which is subsequently converted by means of a nonlinear optical material to another frequency more suitable for operation of the system.

16. A system according to claims 9, 10 and 13 wherein the illuminating laser source operates in a pulsed mode which is synchronized to the temporal windowing of the image intensifier/shutter device in order to select the working distance and distance interval of the light reflected to the detector.
17. A system according to claim 2 wherein the detector used is a photomultiplier tube.
18. A system according to claim 2 wherein the detector used is an avalanche photodiode.
19. A system according to claim 3 wherein the detector is a conventional CCD or CMOS TV camera which does not include any image intensifier device.
20. A system according to claim 2 wherein the scanning is made with an electro-optic or acousto-optic device.
21. A system according to claim 2 wherein the detector is continuously aimed at the point or zone of the scene illuminated by the scanned being illuminated.